

(1390 REV. 5-93) US DEPT. OF COMMERCE PATENT & TRADEMARK OFFICE TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		ATTORNEY'S DOCKET NUMBER 108518 U.S. APPLICATION NO. (if known, sec 37 C.F.R. 1.5) <div style="font-size: 1.5em; font-weight: bold; text-align: center;">09/762386</div>
INTERNATIONAL APPLICATION NO. PCT/EP99/04917	INTERNATIONAL FILING DATE June 7, 1999	PRIORITY DATE CLAIMED July 8, 1998
TITLE OF INVENTION CUT-RESISTANT ARTICLE OF ARAMID MICROFILAMENTS		
APPLICANT FOR DO/EO/US Johannes Manten		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information: 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1). 4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date. 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau. c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US) 6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)). 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)). Items 11. to 16. below concern other document(s) or information included: 11. <input type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 14. <input type="checkbox"/> A substitute specification. 15. <input type="checkbox"/> Entitlement to small entity status is hereby asserted. 16. <input type="checkbox"/> Other items or information:		

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.54) 09/762386	INTERNATIONAL APPLICATION NO. PCT/EP99/04917	ATTORNEY'S DOCKET NUMBER 108518
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17. <input checked="" type="checkbox"/> The following fees are submitted: Basic National fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO\$860.00 International preliminary examination fee paid to USPTO (37 CFR1.482)\$690.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))\$710.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO\$1,000.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)\$ 100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =	CALCULATIONS	PTO USE ONLY
ENTER APPROPRIATE BASIC FEE AMOUNT =	\$860.00	

Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
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Claims	Number Filed	Number Extra	Rate		
Total Claims	7- 20 =	0	X \$ 18.00	\$	
Independent Claims	1- 3 =	0	X \$ 80.00	\$	
Multiple dependent claim(s)(if applicable)			+ \$270.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$860.00	
Reduction by 1/2 for filing by small entity, if applicable.				-	\$
SUBTOTAL =				\$860.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 month from the earliest claimed priority date (37 CFR 1.492(f)).				+	\$
TOTAL NATIONAL FEE =				\$860.00	
				Amount to be refunded	\$
				Charged	\$

a. ☒ Check No. 116113 in the amount of \$860.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Director is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 15-0461. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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NAME: William P. Berridge
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 REGISTRATION NUMBER: 36,430

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Johannes MANTEN

Application No.: U. S. National Stage of
PCT/EP99/04917

Filed: February 7, 2001

Docket No.: 108518

For: CUT-RESISTANT ARTICLES OF ARAMID MICROFILAMENTS

PRELIMINARY AMENDMENT

Director of the U.S. Patent and Trademark Office
Washington, D. C. 20231

Sir:

Prior to initial examination, please amend the above-identified application as follows:

IN THE CLAIMS:

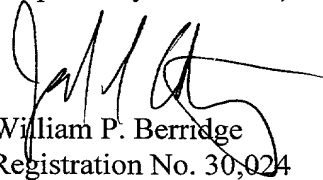
Please amend claims 4-7 as follows:

4. (Amended) The cut-resistant article of claim 1 wherein the titer of the microfilaments is equal to or smaller than 1.3 dtex (1.3×10^{-4} g/m).
5. (Amended) The cut-resistant article of claim 1 wherein the microfilaments are in the form of staple fibers with a length between 38 and 100 mm.
6. (Amended) The cut-resistant article of claim 1 wherein the microfilaments are in the form of stretch breaking yarn or endless filament yarn.
7. (Amended) The cut-resistant article of claim 1 wherein the article is a glove.

REMARKS

Claims 1-7 are pending. By this Preliminary Amendment, claims 4-7 are amended.
The attached Appendix includes marked-up copies of each rewritten paragraph (37 C.F.R.
1.121(b)(iii))

Respectfully submitted,



William P. Berridge
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WPB:JSA/cln

Date: February 7, 2001

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DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461
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APPENDIX

4. The cut-resistant article of ^{claim 1} ~~any one of claims 1-3~~ wherein the titer of the microfilaments is equal to or smaller than 1.3 dtex (1.3×10^{-4} g/m).
5. The cut-resistant article of ^{claim 1} ~~any one of claims 1-4~~ wherein the microfilaments are in the form of staple fibers with a length between 38 and 100 mm.
6. The cut-resistant article of ^{claim 1} ~~any one of claims 1-4~~ wherein the microfilaments are in the form of stretch breaking yarn or endless filament yarn.
7. The cut-resistant article of ^{claim 1} ~~any one of claims 1-6~~ wherein the article is a glove.

CUT-RESISTANT ARTICLES OF ARAMID MICROFILAMENTS

- 5 The invention pertains to cut-resistant articles made of aromatic polyamide microfilaments.

It is known that cut-resistant articles can be made of aromatic polyamide (polyaramid) fibers. In DE 29713824 a protective glove has been described
10 the lining of which comprises flexible aramid fiber. In WO 9721334 penetration-resistant compositions have been disclosed in which yarns of aramid fibers are bonded to a polymeric continuum. This material is primarily aimed at body armor for protection against ballistic projectiles, but it is also described that the compositions can be used against sharp
15 objects, such as knives, in gloves, sleeves, shoes, and the like. Gloves made from poly(para-phenylene terephthalate) yarn (p-aramid yarn) are commercially available, for instance, under the name Twaron® Safety Gloves.

20 Although these articles, in particular gloves, are suitable in many cases, there is still a need for improvement. Such improvement includes a better resistance against stubbing and cutting by sharp objects, such as nails, knives, and the like, but also increase of wear comfort, freedom of movement, and enhanced suppleness are long sought improvements.

25

It has now been found that cut-resistant articles with improved properties in comparison to known articles can be obtained by using microfilaments of aromatic polyamide (polyaramid).

Aromatic polyamide microfilaments as such are known, for instance from
30 EP 241,681, wherein articles made of polyaramid microfilaments have been disclosed for use as ballistic protection structures. However, it is

unknown for articles made of polyaramid microfilaments to have substantially improved properties with respect to cut resistance and wear comfort.

The present invention therefore pertains to articles made from polyaramid microfilaments, and in particular to gloves, sleeves, and cut-protective garments in general. Woven fabrics, knits, or needle felts may be applied. A plurality of layers may be used to improve the performance, and if required, additional layers of a different material, for instance, metallized materials for additional heat protection, may be added.

10

The aromatic polyamide (polyaramid) may be any aromatic polyamide, such as obtained by the polymerization of an aromatic diamine and an aromatic di-acid chloride. More preferred are para-aromatic polyamides, and most preferred is poly(para-phenylene terephthalate) (PPD-T), which can be obtained from p-phenylenediamine and terephthaloyl chloride.

20

The aromatic polyamide is spun into microfilaments in a manner known in the art and the spun fiber can be used as endless filament yarn, stretch breaking yarn or, more preferably, as spun yarn based on staple fiber. The spun yarns of this invention can be made by any appropriate spinning processes, among which can be mentioned spinning processes, such as cotton, worsted, and woolen ring spinning systems, and open end spinning processes. If staple fibers are used for the manufacture of cut-resistant articles, preferably staple fibers with a length between 38 and 100 mm are used.

25

The microfilaments have a titer of at least 1.3 dtex (1.3×10^{-4} g/m) or smaller, preferably equal to or less than 1.0 dtex (10^{-4} g/m).

30

The cut-resistant articles of this invention such as gloves are manufactured, for instance, by knitting the yarn obtained from the aromatic polyamide microfilaments.

The yarns according to the present invention are more cut-resistant than comparative standard yarns with titers above 1.3 dtex (1.3×10^{-4} g/m). If gloves are made of these microfilaments, the gloves have superior wear comfort in comparison with gloves with standard filaments. The gloves made with microfilaments are much more supple and therefore give the user a high wearing comfort. These gloves therefore are also eminently suitable for performing subtle tasks.

The invention is further illustrated by the following experiments

10

Knitted samples made out of standard spun yarn and microfilament spun yarn were compared:

The cut resistance was established according to DIN EN 388:

15

	standard	micro- filament	standard	micro- filament	standard	micro- filament
filament titer (dtex)	1.7	0.93	1.7	0.93	1.7	0.93
staple fiber titer	Nm 28/2	Nm 28/2	2 x Nm 50/2	2 x Nm 80/2	2 x Nm 80/2	2 x Nm 50/2
plied yarn twist	α 120	α 120	α 100	α 100	α 100	α 100
density (horizontal cm ⁻¹ x vertical cm ⁻¹)	7 x 11	7 x 11	7 x 10	7 x 10	7 x 9.5	7 x 9.5
smallest index	6.5	9.1	3.3	3.6	2.1	5.7
performance level	3	3	2	2	1	3

Conclusion: The smallest index is larger for the microfilament yarn than for the standard yarn. The performance was always better for the microfilament yarn. Where the performance has the same number according to DIN EN 388, the standard sample is at the lower end and the microfilament sample at the higher end of the performance level.

20

Moreover, the knitted fabrics based on microfilaments are much softer and have a finer "hand" than comparable fabrics based on standard fibers with a count of 1.7 dtex.

- 5 In addition, the mechanical properties of spun yarns based on microfilament and standard fibers have been investigated. These spun yarns were produced according to the cotton ring spinning process. As can be seen from the tables below, the strength is considerably improved for the microfilament spun yarns. We believe that the higher tensile strength of
- 10 the microfilament spun yarns is responsible for the improved cut resistance of fabrics made from microfilaments. The flexibility was determined according to DIN 53362. The flexibility, denoted as the bending stiffness, is a measure for the "grip" and the suppleness of the gloves.

	standard	micro-filament	standard	micro-filament
filament titer (dtex)	1.7	0.93	1.7	0.93
staple fiber titer	Nm 50/2	Nm 50/2	Nm 50/2	Nm 50/2
yarn twist	α 100	α 100	α 120	α 120
strength (N)	39.47	43.55	39.72	42.97
bending stiffness (cN/cm ²)	56.89	9.90	17.60	13.60

15

	standard	micro-filament	standard	micro-filament
filament titer (dtex)	1.7	0.93	1.7	0.93
staple fiber titer	Nm 80/2	Nm 80/2	Nm 80/2	Nm 80/2
yarn twist	α 100	α 100	α 120	α 120
strength (N)	20.96	21.52	19.99	21.03
bending stiffness (cN/cm ²)	12.47	5.52	12.94	4.37

Conclusion: the strength is considerably improved for microfilament staple fibers, whereas in all cases improved bending stiffness was found for gloves made from microfilaments.

Claims

1. A cut-resistant article comprising aromatic polyamide microfilaments.
- 5 2. The cut-resistant article of claim 1 comprising para-aramid microfilaments.
3. The cut-resistant article of claim 2 comprising poly(para-phenylene terephthalate) microfilaments.
- 10 4. The cut-resistant article of any one of claims 1-3 wherein the titer of the microfilaments is equal to or smaller than 1.3 dtex (1.3×10^{-4} g/m).
- 15 5. The cut-resistant article of any one of claims 1-4 wherein the microfilaments are in the form of staple fibers with a length between 38 and 100 mm.
- 20 6. The cut-resistant article of any one of claims 1-4 wherein the microfilaments are in the form of stretch breaking yarn or endless filament yarn.
7. The cut-resistant article of any one of claims 1-6 wherein the article is a glove.

**DECLARATION AND POWER OF ATTORNEY
UNDER 35 USC §371(c)(4) FOR
PCT APPLICATION FOR UNITED STATES PATENT**

As a below named inventor, I hereby declare that:
my residence, post office address and citizenship are as stated below under my name;

I verily believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought, namely the invention entitled: CUT-RESISTANT ARTICLES OF ARAMID MICROFILAMENTS

described and claimed in international application number PCT/EP99/04917 filed July 6, 1999.

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations §1.56.

Under Title 35, U.S. Code §119, the priority benefits of the following foreign application(s) filed by me or my legal representatives or assigns within one year prior to my international application are hereby claimed:

Netherlands Patent Application No. 98202659.3 filed August 7, 1998

The following application(s) for patent or inventor's certificate on this invention were filed in countries foreign to the United States of America either (a) more than one year prior to my international application, or (b) before the filing date of the above-named foreign priority application(s):

I hereby appoint the following as my attorneys of record with full power of substitution and revocation to prosecute this application and to transact all business in the Patent Office:

**James A. Oliff, Reg. No. 27,075; William P. Berridge, Reg. No. 30,024;
Kirk M. Hudson, Reg. No. 27,562; Thomas J. Pardini, Reg. No. 30,411;
Edward P. Walker, Reg. No. 31,450; Robert A. Miller, Reg. No. 32,771;
Mario A. Costantino, Reg. No. 33,565; Stephen J. Roe, Reg. No. 34,463;
Joel S. Armstrong, Reg. No. 36,430; Christopher W. Brown, Reg. No. 38,025; and
Richard E. Rice, Reg. No. 31,560.**

ALL CORRESPONDENCE IN CONNECTION WITH THIS APPLICATION SHOULD BE SENT TO OLIFF & BERRIDGE, PLC, P.O. BOX 19928, ALEXANDRIA, VIRGINIA 22320, TELEPHONE (703) 836-6400.

I hereby declare that I have reviewed and understand the contents of this Declaration, and that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

1	Typewritten Full Name of Sole or First Inventor	<u>Johannes</u> <u>MANTEN</u>		
		Given Name	Middle Initial	Family Name
2	Inventor's Signature	<u>[Signature]</u>		
3	Date of Signature	<u>February, 19th 2001</u>		
		Month	Day	Year
	Residence:	<u>Krefeld</u>	<u>GERMANY</u>	<u>Dex</u>
		City	State or Province	Country
	Citizenship:	<u>GERMANY</u>		
	Post Office Address:	<u>Uerdingerstrasse 628, D-47800 Krefeld</u>		
	(Insert complete mailing address, including country)	<u>GERMANY</u>		

Note to Inventor: Please sign name on line 2 exactly as it appears in line 1 and insert the actual date of signing on line 3.

IF THERE IS MORE THAN ONE INVENTOR USE PAGE 2 AND PLACE AN "X" HERE ☐

(Discard this page in a sole inventor application)

1 **Typewritten Full Name
of Joint Inventor**

Given Name

Middle Initial

Family Name

2 **Inventor's Signature:**

3 **Date of Signature:**

Month

Day

Year

Residence:

City

State or Province

Country

Citizenship:

Post Office Address:
(Insert complete mailing
address, including

country)

1 **Typewritten Full Name
of Joint Inventor**

Given Name

Middle Initial

Family Name

2 **Inventor's Signature:**

3 **Date of Signature:**

Month

Day

Year

Residence:

City

State or Province

Country

Citizenship:

Post Office Address:
(Insert complete mailing
address, including

country)

1 **Typewritten Full Name
of Joint Inventor**

Given Name

Middle Initial

Family Name

2 **Inventor's Signature:**

3 **Date of Signature:**

Month

Day

Year

Residence:

City

State or Province

Country

Citizenship:

Post Office Address:
(Insert complete mailing
address, including

country)

1 **Typewritten Full Name
of Joint Inventor**

Given Name

Middle Initial

Family Name

2 **Inventor's Signature:**

3 **Date of Signature:**

Month

Day

Year

Residence:

City

State or Province

Country

Citizenship:

Post Office Address:
(Insert complete mailing
address, including

country)

Note to Inventor: Please sign name on line 2 exactly as it appears in line 1 and insert the actual date of signing on line 3.

This form may be executed only when attached to the first page of the Declaration and Power of Attorney of the application to which it pertains.